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Reduced Certification Testing for Motorcycles

May 1975

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Standards Development and Support Branch
Emission Control Technology Division
Office of Mobile Source Air Pollution Control
Office of Air and Waste Management
U.S. Environmental Protection Agency

Reduced Certification Testing:
Small Volume Motorcycle Manufacturers

The following two reports discuss the cost and air quality impacts of reduced certification testing on small volume motorcycle manufacturers. Background discussion on light duty vehicle reduced testing is also presented for perspective.

The discussion of economic impact estimates the costs of certification for motorcycle manufacturers and compares these costs to those for automobile manufacturers. Certification costs for small volume manufacturers are calculated assuming that deterioration factors are assigned to these manufacturers by EPA and that the durability distance requirement is waived for these manufacturers.

Based on the significant sales break point at 10,000 units per manufacturer, it is recommended that the reduced testing break point for motorcycles be established at 10,000 units per manufacturer. In addition, it is recommended that the initial reduced testing policy eliminate the durability requirement for manufacturers with sales of less than 10,000 units provided the manufacturer accepts deterioration factors established by EPA; and the number of emission data vehicles should be reduced where possible for manufacturers with sales of less than 2000 units. This policy would then be reviewed continually and modified as necessary.

The air quality impact of reduced testing estimates hydrocarbon emissions in the LA AQCR for the years 1978 through 1990. Emission rates are assumed to deteriorate significantly for those manufacturers who sell less than 10,000 units and qualify for reduced testing. These rates are then compared to those resulting from requiring full durability testing by all manufacturers and, thus, little emission deterioration. The comparison shows minimal air quality impact with relaxed durability requirements for manufacturers who sell less than 10,000 units.

Prepared by

Project Manager

Approved by

Approval

Branch Chief

Approval

Division Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Reduced Testing for Small Volume Motorcycle Manufacturers (85.078-5(a))

DATE: March 11, 1975

FROM: Daniel P. Harkin Jr.
Certification & Surveillance Division Staff

TO: Edmund J. Brune
Director, Certification & Surveillance Division

Background:

1) The original intent of the reduced testing provision for light duty vehicles (85.075-5(a)) was to reduce the economic impact of certification testing on small (under 2000 unit sales) vehicle manufacturers. It was felt that the cost burden of certification testing could prohibit some manufacturers from gaining certification or could be passed on as a significant part of the retail price of the vehicle for small volume manufacturers which would adversely affect their sales and possibly their existence.

2) The method which CSD chose to reduce testing for LDV was to relax the requirements for durability vehicle selection (85.074-5(c)) and for "A" selection emission data vehicles (85.074-5(b)(2)). The 1974 and earlier requirements for durability selection were that the manufacturer run two vehicles to 50,000 miles for each control system. For small volume manufacturers this requirement was, in some cases, reduced to one durability vehicle. The requirement for "A" selection emission data vehicles was a minimum of two vehicles per 85.074-5(b)(2). For small volume manufacturers this was generally reduced to one emission data vehicle. The impact of this reduced testing effectively cut the cost of certification by 50 percent. For a small manufacturer with vehicles of $4500 average retail price, the cost of two durability and two emission data vehicles represented 3 percent of the retail price or about $142.00 per car (this assumes the manufacturer built 2,000 vehicles). The reduced testing made this only 1.5 percent. The average of the small volume manufacturers sales is fewer than 500 vehicles per manufacturer, which raises the cost per vehicle significantly.

3) Two factors have changed since the original inception of the reduced testing provisions:

a. The test vehicle selection requirements of 85.074-5 have been relaxed so that two durability and two "A" selection emission data vehicles are no longer required for 1975 and later model years (85.075-5). Therefore, there are no areas in which testing may be significantly reduced for small volume manufacturers.

EPA Form 1110-1 (Rev. 6-70)

Small volume manufacturer (≤10,000 units):[1] = 3 percent
Total number of manufacturers = 35
Total number of manufacturers ≤ 2000 sales = 20 (57 percent)
Total number of manufacturers≤10,000 sales = 29 (83 percent)

It is evident that, at least at the outset, a larger portion of both total manufacturers and industry sales is represented by small volume motorcycle manufacturers than by small volume LDV manufacturers. Any regulations impacting that a large portion (3 percent sales, 57 - 83 percent manufacturers) of the motorcycle industry must be considered carefully for the nature of the impact.

3) The motorcycle regulations have been patterned after the existing LDV regulations in most areas. The fleet selection requirements have been only slightly modified and a minimum of one durability motorcycle per engine-system combination and one emission data motorcycle per displacement are required.

4) The economic impact of full certification for the large motorcycle manufacturers is the same as that for large LDV manufacturers. The average percent of retail price impact on both large LDV manufacturers and large motorcycle manufacturers is .145 percent. The economic impact of full certification on small volume manufacturers is:

≤2000 units - 3 to 6 percent of retail price
≤10,000 units - about one percent of retail price

This is greater than the impact originally estimated for small volume LDV manufacturers prior to 1975.

5) The most significant portion of the cost of certification is the durability mileage accumulation and testing. This is true also for LDV.

a. If the option of reduced testing is exercised to reduce only emission data vehicle testing, the influence on percent retail price is less than .5 percent reduction in most cases.

b. If the option of reduced emission testing is exercised to eliminate durability testing, the influence on percent retail price is:

≤2000 units-cost of 1-3 percent/unit
≤10,000 units-cost of .2-.4 percent/unit

[1] By examining the 1973 sales data presented in Figure 1, it can be seen that there is a definite division between the "large volume" motorcycle manufacturers and the "small volume" motorcycle manufacturers occurring at about 10,000 unit sales.

c. If the option of reduced testing is exercised to eliminate durability testing below 10,000 unit sales and to reduce emission data testing below 3,000 unit sales, the impact is:

10,000 units - cost percent of retail = .3 to .4 percent
3,000 units - cost percent of retail = .6 to 1.0 percent

This compares favorably with the cost percent for the large volume motorcycle manufacturers of .145 percent of retail price.

6) For the first year or two, the certification group responsible for motorcycles will still be coming up to speed on motorcycle certification. While the regulations have been written based on the best available information, it is conceivable that some revisions to useful life, maintenance, driving schedule, etc., may be required based on what occurs during the first year or two of certification. For all manufacturers, the first year of certification will be the first time any significant durability mileage is accumulated on motorcycles and some problems will probably come to light. It is felt that the large volume manufacturers are better equipped to run durability and to give an accurate analysis of the certification process than small volume manufacturers.

Recommendations

1) That 85.478-½(e) be modified to read: "Any manufacturer whose projected sales of new motorcycles subject to this subpart for the year of production for which certification is sought is less than 10,000 vehicles may request a reduction in the number of test vehicles determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure."

2) That CSD implement a policy for reduced testing under 85.487-5(e) which would:

a. Eliminate durability testing for those motorcycle manufacturers with sales of less than 10,000 units provided the manufacturer accept deterioration factors of:

HC = 1.1234
CO = 1.1403
NO_x = 1.0296
(based on average 1974 LDV deterioration factor information)

b. Reduce emission data testing requirements for manufacturers with sales of less than 3,000 units. Where optional configurations might be selected under 85.478-5(b)(3) they would be combined with the (b)(2) displacement selected data vehicles to yield a "worst case" vehicle for each displacement.

c. This policy be modified, as required in future years, to meet the impact on the industry and on air quality.

1. Revise D.F. assignments based on each year's durability results from large H/D manufacturers D.F data.

2. Reassign sales split points, possibly offering no durability break but emission data breaks to larger volume manufacturers (4000-10,000 units perhaps) based on a new impact study.

cc: D. M. Kimball
J. M. Hansen
L. I. Ranks
J. C. Thomson
W. Houtman
W. Oliver
R. Jenkins

APPENDIX

MOTORCYCLE SALES DATA (1971 Year-To-Date Folk Data)

Honda	464,824
Kawasaki	126,908
Suzuki	137,453
Yamaha	213,014
Harley Davidson	54,932
BSA-Triumph-Norton	35,859
BMW	6,693
Hodaka	8,606
Bultaco	4,313
Bennelli	900
Ducati	1,000
Husqvarana	3,100
Jawa	2,300
Moto Guzzi	3,000
Ossa	2,900
+ 20 smaller manufacturers (or 1,078 M/C per manufacturer avg.)	21,556
Total Sales	1,087,360

AVERAGE LARGE AUTO MANUFACTURER COST TO CERTIFY

1975 GM - 2,356,000 Sales
About 35 families, Average 4 data cars/family

Total Cost

35 X $125,000 Durability =	4,375,000
140 X $17,000 Data	2,380,000
	$6,755,000

Cost/car = $2.99
Avg. Retail $4500
Cost % = .06%

1975 Ford - 1,087,000 Sales
About 35 families, Average 4 data cars/family

Total Cost

35 X$125,000 Durability	4,375,000
140 X $17,000 Data	2,380,000
	$6,755,000

Cost/car = $6.21
Avg. Retail $4500
Cost % = .14%

1975 Chrysler - 611,477 Sales
About 24 families, Average 4 data cars/family

Total Cost

24 X$125,000 Durability	3,000,000
96 X $17,000 Data	1,632,000
	$4,632,000

Cost/car = $7.57
Avg. Retail $4500
Cost % = .16%

AVERAGE LARGE AUTO MANUFACTURER COST TO CERTIFY - continued

1975 AMC - 193,110 Sales
About 10 families, Average 4 data cars/family

Total Cost

10 X$125,000 Durability =	1,250,000
40 X $17,000 Data	680,000
	$1,930,000

Cost/car = $9.99
Avg. Retail $4500
Cost % = .22%

BIG FOUR AVERAGE

AVERAGE % COST = .145%

<2000 SALES AVERAGE

AVERAGE % COST = 1.8% (prior to 1974)

12.4 % COST% of BIG FOUR

SMALL AUTO MANUFACTURER CERTIFICATION COST

I. Durability

A.	Prototype Vehicle Cost	$25,000
B.	Mileage & Maintenance $1.90/mi X 50K	95,000
C.	Testing $300/test X 14 Tests	4,200
		$124,200
	≈	$125,000

II. Emission Data

A.	Prototype Vehicle Cost	$10,000
B.	Mileage & Maintenance $1.60/mi X 4K	6,400
C.	Testing $300 X 2 Tests	600
		$17,000

Assume 1 engine family, limited product line for manufacturer of 3000 or less s/les.

1 Durability = $125,000
2 Data (INT, IAT) 34,000
$159,000

Cost/Car = $60
Avg. Retail 4300 (based on prior to 1974)

Cost/Car = 1.8% of retail price

MOTORCYCLE MANUFACTURER CERTIFICATION COST

I. Durability ≥ 170cc

A.	Prototype Vehicle Cost	$8,000
B.	Mileage & Maintenance $1.90/mi X 19000	36,100
C.	Testing $300/test X 15 tests	4,500
		$48,600
	≈	$50,000

II. Emission Data ≥ 170cc

A.	Prototype Vehicle Cost	$4,000
B.	Mileage & Maintenance $1.60/mi X 3000 Mi	4,800
C.	Testing $300/Test X Tests	600
		$9,400

MOTORCYCLE MANUFACTURER CERTIFICATION COST

I. Durability ¶ 1/Occ

A.	Prototype Cost	$8,000
B.	Mileage & Maintenance $1.80 X 9000	17,000
C.	Testing $300/Test X 12	3,600
		$28,700
		≅ $30,000

II. Emission Data ¶ 1/Occ

A.	Prototype Cost	$4,000
B.	Mileage & Maintenance $1.80 X 2000	3,200
C.	Testing $300/Test X 2	600
		$7,800

AVERAGE LARGE MOTORCYCLE MANUFACTURER COST TO CERTIFY

Honda - 464,836 Sales
6 Families 33 Data Bikes
4 ≥ 170cc Families 14 Data Bikes
3 ≤ 170cc Families 9 Data Bikes

Total Cost

4	X 50,000 ≥ 170cc Durability	=	$200,000
14	X 9,000 ≥ 170cc Data	=	131,600
2	X 30,000 ≤ 170cc Durability	=	60,000
9	X 7,800 ≤ 170cc Data	=	70,200
			$461,800

Cost/Bike = $ .99
Avg. Retail $1200
Cost % .08%

Yamaha - 213,014 Sales
4 Families 11 Data Bikes
3 ≥ 170cc Families 9 Data Bikes
1 ≤ 170cc Family 3 Data Bikes

Total Cost

3	X 50,000 ≥ 170cc Durability	=	$150,000
9	X 9,400 ≥ 170cc Data	=	84,600
1	X 30,000 ≤ 170cc Durability	=	30,000
2	X 7,800 ≤ 170cc Data	=	15,600
			$280,200

Cost/Bike = $1.31
Avg. Retail $1200
Cost % .1%

AVERAGE LABOR MOTORCYCLE MANUFACTURER COST TO CERTIFY-continued

Suzuki - 137,455 Sales
6 Families 14 Data Bikes
5 ≥ 170cc Families 10 Data Bikes
1 ≤ 170cc Family 4 Data Bikes

Total Cost

5 X	50,000 ≥ 170cc Durability	=	$250,000
10 X	9,400 ≥ 170cc Data	=	94,000
1 X	30,000 ≤ 170cc Durability	=	30,000
4 X	7,800 ≤ 170cc Data	=	31,200
			$405,200

Cost/Bike = $2,94
Avg. Retail= $1200
Cost % = .2%

Kawasaki - 136,908 Sales
5 Families 14 Data Bikes
4 ≥ 170cc Families 9 Data Bikes
1 ≤ 170cc Families 5 Data Bikes

Total Cost

4 X	50,000 ≥ 170cc Durability	=	$200,000
9 X	9,400 ≥ 170cc Data	=	84,600
1 X	30,000 ≤ 170cc Durability	=	30,000
5 X	7,800 ≤ 170cc Data	=	39,000
			$353,600

Cost/Bike = $2,58
Avg. Retail = $1200
Cost % = .2%

AVERAGE COST - BIG 4 MOTORCYCLE MANUFACTURERS
AS A% OF RETAIL PRICE

If Motorcycle allowance is raised to 10,000 unit sales:

Class I: > 170cc
$78,200 ÷ 10,000 sales W/ durability = $38,300

Cost/Bike =	$7.82	$7.82
Avg. Retail	$1500	$1500
Cost % =	.5%	.18%

Class II: ≤ 170cc
$33,400 ÷ 10,000 Sales W/O Durability = $23,400

Cost/Bike =	$3.34	$2.34
Avg. Retail	$900	$900
Cost % =	.6%	.26%

Class III: ≤ 170cc
$131,600 ÷ 10,000 Sales W/O Durability $51,600

Cost/Bike =	$13.16	$5.16
Avg. Retail	$1200	$1200
Cost % =	$1.09	43%

Small Volume (≤ 2000 unit sales) Manufacturer W/O Durability

Case I = ≥ 170cc
$38,800 ÷ 2000 units

Cost/Bike = $14.10
Avg. Retail ≥ 170cc = $1500
Cost % = .97%
W/ 3 Data Bikes = .6% (9.40 Cost/Bike)

Case II = ≤ 170cc
$3,400 ÷ 2000 units

Cost/Bike = $11.40
Avg. Retail ≤ 170cc = $900
Cost % = 1.3%
W/ 3 Data Bikes = .8%(7.60 Cost/Bike)

Case III = ≤ 170cc
$51,600 ÷ 2000

Cost/Bike = $25.00
Avg. Retail $1200
Cost % = 2.15%
W/ Reduced Data Bike Testing = 1%

CASE I - Small Motorcycle manufacturer ≤ 3000 units building only > 170cc bikes with more than 1 displacement.

1 Family

1 Durability Vehicle	$50,000
2 Data Vehicles (Displacement)	28,800
1 Optional Data	
	$78,700

Cost/Bike = $40
Avg. Retail > 170cc = $1500
Cost % = 2.7%
W/2 Data 2.3%
W/1 Data 1.0%

CASE II - Small Motorcycle manufacturer ≤ 3000 units building only ≤ 170cc bikes with more than one displacement.

1 Family

1 Durability Vehicle	$30,000
2 Data Vehicles (displacement)	23,400
1 Optional Data	
	$53,400

Cost/Bike = $27
Avg. Retail ≤ 170cc = $900
Cost % = .3%
W/2 Data = 2.5%
W/1 Data = 2.1%

Case III - Small Motorcycle manufacturer ≤ 3000 units building both ≤ 170cc & > 170cc both with more than 1 displacement

2 Families

1 > 170cc	$78,300
1 ≤ 170cc	53,400
	$131,600

Cost/Bike = $65.00
Avg. Retail $1200
Cost % = 5.4%
W/3 Data/Fam.= 4.9%
W/1 Data/Fam.= 4.1%

SOURCES

1) Cost To Certify: General Motors Corp.
Dave Horchler GM V.E.I.
Bob Stempel, Chevrolet Engineering

Prototype Vehicle
Durability - If modification to production car = $ 25,000
Durability - If all new car $100,000 - $500,000
Emission Data- 10,000

50,000 Mile Cost
Durability mileage & maintenance = $1.90/Mi
Durability testing (in house) = $300/Test
Outside testing (est.) $600 +/Test

2) Large Manufacturers Sales - Auto - Automotive News
1974 Total year production

All Manufacturer Sales - Motorcycles - 1973 Polk Data

3) Small Manufacturer Sales - 1974 Part 1 Application (Auto)

4) Small Manufacturer Retail Price - 1973 - 1974 World Cars Catalogue

5) Auto Average Retail - Estimated on 1975 Prices - $4300

6) Motorcycle Average Retail - Estimated on 1974 Prices
≥ 170cc $1500
≤ 170cc $ 900

7) Motorcycle Prototype Cost - Based on Ratio of Prototype to Retail of Auto

$$\frac{25000}{4500} = 5.55$$

Motorcycle 1500 X 5.55 = $8000

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Air Quality Impact of Reduced Testing for Small Volume Manufacturers DATE: April 1, 1975

FROM: William Rogers Oliver, SDSB

TO: The Record

The issue of reduced testing for small volume motorcycle manufacturers has been considered recently in order to reduce the cost of motorcycle certification. One consideration of reduced certification testing has been estimating its impact on air quality. Since no data exist to determine the precise air quality impact, a worst case approach toward deterioration rates has been used for this report.

Air quality impact has been estimated previously for various motorcycle hydrocarbon emission standards in the LA AQCR. The base case used for comparison purposes in this report was the displacement related HC standard for the LA AQCR for the 1978 and 1979 years of production and the LDV statutory HC standard for 1980 and beyond. Various assumptions were necessary for estimating air quality impact such as population growth rates, annual motorcycle distance traveled, and emission [illegible] determination. Using these assumptions and making no allowa[illegible] possible reduced testing effects, the following emission [illegible]lted.

Year	HC, Tons/Day
1978	23.36
1979	22.22
1980	18.09
1985	4.235
1990	1.415

Estimating the air quality impact of reduced certification testing for small volume motorcycle manufacturers can be done by considering the form of reduced certification. This report will consider the effect on air quality of removing the durability distance accumulation requirement for motorcycle manufacturers who sell less than 10,000 U.S. street legal units. It was assumed that motorcycles built by these manufacturers met emission standards at the stabilized emission point and were assigned deterioration factors (D.F.) of 1.0 for certification purposes. However, when measured in the field, the motorcycles built by these small volume manufacturers were assumed to deteriorate significantly more than this. In order to measure this effect on air quality, an assumption was needed on deterioration factors for these motorcycles. By reviewing available LDV data, the worst case deterioration factor for this case was assumed to be 2.0. Emission factors for these motorcycles, then, were two times the factors of the completely controlled motorcycles.

Assumptions used for the base case air quality estimates were used for the estimates of reduced testing impact on air quality. In addition, the break point for reduced testing was assumed to be 10,000 units per manufacturer. A 10,000 unit break point means that the "Big Six" motorcycle manufacturers would not qualify for reduced testing, but approximately 20 other manufacturers representing approximately 5% of all U.S. street legal motorcycle sales would qualify. (The 5% estimate was used in all calculations.) As an example, in the LA AQCR in 1978, 254,231 motorcycles were precontrolled (1977 and earlier), 59,676 met the displacement dependent HC standard, and 3141 motorcycles were produced by manufacturers qualifying for reduced testing and had D.F.s of 3.0.

Using these assumptions, the following emission rates resulted from requiring full certification by the Big Six manufacturers while removing the durability requirement for manufacturers who sell less than 10,000 units in the U.S.

Year	HC, Tons/Day
1978	23.53
1979	22.53
1980	18.38
1985	4.396
1990	1.486

Emission rates were higher for this case than the base case, as expected. However, significant emission reductions did occur.

To compare the base case and the worst case deterioration factor computations, the following results represent the percent increase in emissions over the base case emission reductions resulting from a two fold increase in emissions from motorcycles built by manufacturers selling less than 10,000 U.S. street legal units.

Year	Emission Increase over Base Case
1978	0.7%
1979	1.4%
1980	1.6%
1985	3.8%
1990	5.0%

As seen in the table, the increase in emissions over the base case is very minimal. Thus, a reduced testing program with relaxed durability requirements for motorcycle manufacturers with U.S. sales volumes less than 10,000 units will have minimal air quality impact.